

ULTRASENSITIVE, HIGH ACCURACY MEASUREMENTS OF TRACE GAS SPECIES

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Our laboratory seeks to apply novel cavity-enhanced spectroscopic techniques to present problems in atmospheric and physical chemistry. Primarily we use cavity ring-down spectroscopy in which the passive decay of optical power within a Fabry-Pérot resonator is utilized to extract an absorption signal. With this technique we have demonstrated quantum (shot) noise limited sensitivities in both the near-infrared and mid-infrared spectral regions. Both commercial and home-built optical frequency combs are employed either to serve as absolute frequency references for molecular spectra or in a multiheterodyne approach for multiplexed sensing. I will discuss this novel instrumentation as well as measurements we have made of atmospherically relevant species such as CO₂, H₂O, O₂, CH₄, and CO with implications for *in situ* and remote (i.e. satellite-based) sensing. I will conclude by discussing future directions and plans for challenging measurements in the mid-infrared.